

# (SHORT QUESTIONS.

$$2. \quad 3x^3 + 7x^2 - 6x$$

$$x(3x^2 + 7x - 6)$$

$$\quad \quad \quad \downarrow \quad \quad \quad \downarrow$$

$$\quad \quad \quad 3 \quad \quad \quad -2$$

$$\boxed{x(x+3)(3x-2)}$$

$$5. \quad m = \frac{3-1}{10-5} = \frac{2}{5}$$

$$y-1 = \frac{2}{5}(x-5)$$

$$y-1 = \frac{2}{5}x - 2$$

$$\boxed{y = \frac{2}{5}x - 1}$$

$$6. \quad (0, 2.67)$$

(using calculator)

$$8. \quad x^2 - 5x - 7 = 0$$

$$x^2 - 5x + \frac{25}{4} = 7 + \frac{25}{4}$$

$$(x - \frac{5}{2})^2 = \frac{53}{4}$$

$$x - \frac{5}{2} = \pm \frac{\sqrt{53}}{2}$$

$$\boxed{x = \frac{5}{2} \pm \frac{\sqrt{53}}{2}}$$

$$10. \quad (f+g)(x) = \sqrt{4x+5} + 2x^2 - 4$$

$$(f-g)(x) = \sqrt{4x+5} - 2x^2 + 4$$

$$(fg)(x) = (\sqrt{4x+5})(2x^2 - 4)$$

$$= 2x^2\sqrt{4x+5} - 4\sqrt{4x+5}$$

$$\left(\frac{f}{g}\right)(x) = \frac{\sqrt{4x+5}}{2x^2 - 4}$$

$$(g \circ f)(x) = g(\sqrt{4x+5})$$

$$= 2(\sqrt{4x+5})^2 - 4$$

$$= 2(4x+5) - 4$$

$$= 8x + 10 - 4 = 8x + 6$$

$$\boxed{D: \{x \mid x \geq -\frac{5}{4}\}}$$

$$11. \quad y = \sqrt{x} \quad (a) \quad y = 0.3\sqrt{x}$$

$$(b) \quad y = 0.3\sqrt{x+5}$$

$$(c) \quad y = 0.3\sqrt{x+5} - 3$$

$$12. \quad x = \frac{\sqrt{2y+5}}{6} \rightarrow 6x = \sqrt{2y+5}$$

$$36x^2 = 2y+5$$

$$2y = 36x^2 - 5$$

$$\boxed{y = \frac{36x^2 - 5}{2}}$$

$$13. \quad V(-5, 3) \quad P(-7, 2)$$

$$2 = a(-7+5)^2 + 3$$

$$2 = a(-2)^2 + 3$$

$$-1 = 4a$$

$$a = -\frac{1}{4} \quad \boxed{y = -\frac{1}{4}(x+5)^2 + 3}$$

$$14. \quad y = 5(x+3)(x-2)(x-4)$$

$$= 5(x+3)(x^2 - 6x + 8)$$

$$= 5(x^3 - 6x^2 + 8x + 3x^2 - 18x + 24)$$

$$= 5(x^3 - 3x^2 - 10x + 24)$$

$$\boxed{y = 5x^3 - 15x^2 - 50x + 120}$$

$$16. \quad x = \frac{-8 \pm \sqrt{64 - 4(21)}}{2} = \frac{-8 \pm \sqrt{64 - 84}}{2}$$

$$= \frac{-8 \pm \sqrt{-20}}{2} = \frac{-8 \pm 2i\sqrt{5}}{2}$$

$$\boxed{x = -4 \pm i\sqrt{5}}$$

$$17. \quad x = 5 \pm i \quad (x+3)(x^2 - 10x + 26)$$

$$x-5 = \pm i \quad x^3 - 10x^2 + 26x$$

$$x^2 - 10x + 25 = -1 \quad + 3x^2 - 30x + 78$$

$$x^2 - 10x + 26 = 0$$

$$\boxed{y = x^3 - 7x^2 - 4x + 78}$$

18.  $f(x) = -3 \log(-x+2) + 5$   
 $= -3 \log(-(x-2)) + 5$   
 stretch by 3  
 reflect across x-axis  
 shift right 2  
 up 5

19.  $\frac{3 \log(x-2)}{\log 5} = \frac{\log(x-3)^3}{\log 5}$   
 $= \boxed{\log_5(x-3)^3}$

21.  $12 - 5 \ln x = 20$   
 $-5 \ln x = 8$   
 $\ln x = -\frac{8}{5}$   
 $\boxed{x = e^{-8/5}}$

22.  $\log(x+20) + \log(5x+5) = 2$   
 $\log(x+20)(5x+5) = 2$   
 $5x^2 + 105x + 100 = 10^2$   
 $5(x^2 + 21x + 20) = 100$   
 $x^2 + 21x + 20 = 20$   
 $x^2 + 21x = 0$   
 $x(x+21) = 0$   
 $x = 0, -21$

~~D:  $x > -20$~~  OR  $D: x > -1$   
 so  $\boxed{x = 0}$

23. H.A.  $\boxed{y = \frac{4}{3}}$

24.  $f(x) = \frac{2x-3}{(3x-2)(x+7)}$   
 V.A.  $\boxed{x = \frac{2}{3} \text{ and } x = -7}$

25. As  $x \rightarrow -\infty$  and  $x \rightarrow \infty$ ,  
 $y$  goes towards 0.

### MULTIPLE CHOICE

8.  $x^3 - 2x^2 + x < 0$   
 $x(x^2 - 2x + 1) < 0$   
 $x(x-1)^2 < 0$  check  $-1: (-1)(-2)^2 < 0$   
 $x \neq 0 \quad x = 1$   
 $\frac{1}{2}: (\frac{1}{2})(-\frac{1}{2})^2 < 0$   
 $2: (2)(2-1)^2 < 0$   
 $(-\infty, 0) \text{ or } x < 0$

(A)

13.  $2x^2 - 5x - 1 = 0$   
 $x = \frac{5 \pm \sqrt{25 - 4(2)(-1)}}{2(2)} = \frac{5 \pm \sqrt{25+8}}{4}$

$\boxed{x = \frac{5 \pm \sqrt{33}}{4}}$  (A)

14.  $M(\frac{3-b}{2}, \frac{4+1}{2}) \rightarrow M(-\frac{3}{2}, 4)$  (A)

15.  $d = \sqrt{(-2-3)^2 + (5+7)^2} = \sqrt{(-5)^2 + (-12)^2}$   
 $= \sqrt{25+144} = \sqrt{169} = \boxed{13}$  (A)

16.  $12 = \sqrt{(x-6)^2 + (9+1)^2}$   
 $144 = (x-6)^2 + 100$   
 $(x-6)^2 = 44$   
 $x-6 = \pm \sqrt{44}$   
 $x = 6 \pm 2\sqrt{11}$  (B)



17. (D)

19.  $y = \frac{1}{x}$   $x \neq 0$  (B)

20.  $(x+2)^2 - 3(x+2) + 4 - (2^2 - 6 + 4)$   
 $x^2 + 4x + 4 - 3x - 6 + 4 - (2)$   
 $x^2 + x$  (B)

21.  $(-\infty, -2) \cup (1, \infty)$  (A)

22. (C) transformed  
 shift down  $\frac{1}{2}$

23.  $m = \frac{4-10}{-7-6} = \frac{-6}{-7} = \frac{6}{7}$   
 (C)

24.  $y - 2 = -\frac{3}{4}(x - 1)$   
 $4y - 8 = -3x + 3$   
 $3x + 4y - 11 = 0$   
 (C)

25.  $x = 7y + 2$   
 $x - 2 = 7y \rightarrow y = \frac{x-2}{7}$   
 (C)

26.  $(fg)(x) = (7x+2)(x^2-9)$   
 $= 7x^3 - 63x + 2x^2 - 18$   
 $= 7x^3 + 2x^2 - 63x - 18$   
 (A)

27.  $f(g(x)) = f(x+2) = 2(x+2)^2 + 1$   
 $= 2(x^2 + 4x + 4) + 1$   
 $= 2x^2 + 8x + 8 + 1$   
 $= 2x^2 + 8x + 9$  (D)

28.  $y = (x-2)^2 - 3$  (C)

30.  $x^4 + 25x^2 + 144$   
 $(x^2+9)(x^2+16)$   
 $(x+3i)(x-3i)(x+4i)(x-4i)$   
 (C)

31. check:  $16 + 8 - 4 + 10 - 30$  (B)

32. (A)

33.  $(3+7i)(6-2i)$   
 $18 - 6i + 42i - 14i^2$   
 $18 + 36i + 14$   
 $32 + 36i$  (D)

34.  $\frac{2}{4-3i} \frac{4+3i}{4+3i} = \frac{8+6i}{16+9} = \frac{8+6i}{25}$   
 (C)

35.  $y = x^2 - 8x + 16 + 2 - 16$   
 $y = (x-4)^2 - 14$  (B)

36. HA  $y = -5$  (A)

$$37. 3^{2x} = 3^4$$

$$2x = 4$$

$$\boxed{x=2}$$

(D)

$$38. 300 e^{-0.076t} = 95.9457$$

(A)

$$39. \log_4 64 = 3$$

(B)

$$\begin{aligned} 40. \log_a 24 &= \log_a 8 \cdot 3 = \log_a 2^3 \cdot 3 \\ &= 3 \log 2 + \log 3 \\ &= 3(0.4307) + 0.6826 \\ &= 1.2921 + 0.6826 \\ &= 1.9747 \end{aligned}$$

(B)

$$41. \log_x 8 = -3$$

$$x^{-3} = 8$$

$$(x^{-1})^3 = 2^3$$

$$x^{-1} = 2$$

$$\frac{1}{x} = 2 \rightarrow \boxed{x = \frac{1}{2}}$$

(C)

$$\begin{aligned} 42. \log \left( \frac{a^2 b}{c} \right)^{\frac{1}{3}} &= \frac{1}{3} \log \frac{a^2 b}{c} \\ &= \frac{1}{3} (\log a^2 + \log b - \log c) \\ &= \frac{2}{3} \log a + \frac{1}{3} \log b - \frac{1}{3} \log c \end{aligned}$$

(C)

$$43. \frac{\log 7}{\log 4} = 1.4037$$

(D)

$$44. 37.5429$$

(A)

$$\begin{aligned} 45. \ln 5e^3 &= \ln 5 + \ln e^3 \\ &= \ln 5 + 3 \end{aligned}$$

(A)

$$46. 3x + 1 > 0$$

$$3x > -1$$

$$x > -\frac{1}{3} \quad \left(-\frac{1}{3}, \infty\right)$$

(B)

$$47. \text{moved left 3.}$$

(D)

$$48. \log(3x+7)(x-2) = 1$$

$$3x^2 + x - 14 = 10$$

$$3x^2 + x - 24 = 0$$

$$\begin{array}{r} 3 \quad +3 \\ 3 \quad -8 \end{array}$$

$$(x+3)(3x-8) = 0$$

$$x = -3, \frac{8}{3}$$

$$D: \cancel{x > -3} \text{ OR } \boxed{x > 2}$$

$$\boxed{x = \frac{8}{3}}$$

(A)

$$49. 3^{5x+1} = 5$$

$$5x+1 = \frac{\log 5}{\log 3}$$

$$5x = \frac{\log 5}{\log 3} - 1 \rightarrow x = \frac{\frac{\log 5}{\log 3} - 1}{5}$$

$$x = 0.09299$$

(B)

$$\begin{array}{r} 3x+5 \\ 51. x-1 \overline{) 3x^2+2x-1} \\ \underline{-3x^2+3x} \phantom{-1} \\ 5x-1 \end{array}$$

$$y = 3x+5$$

(C)

$$52. \text{V.A. } x=1 \quad \text{H.A. } y=1$$

(C)